NASA-CR-197550

IN72121M
7N-46-CR
34028
1P

SECOND ANNUAL PROGRESS REPORT

Title: **AN INVESTIGATION OF THE MID-LATITUDE STRUCTURE OF GEOMAGNETIC STORM EFFECTS IN THE THERMOSPHERE-IONOSPHERE**

PI: M.V. Codrescu, CIRES/University of Colorado

Award NAGW-3530

We have now concluded the first-stage analysis of the massive amounts of information available from the generic storm simulations. A post-run processor that calculates and plots differences (on constant pressure, constant height and at hmF2), between storm and reference runs, has been used to identify storm effects and to reveal the causative mechanisms. A coherent, global picture of the evolution of storm effects in both the thermosphere and the ionosphere has been proposed and published (see JGR paper attached).

This scenario accounts for the neutral dynamics and composition, and for the ionospheric features present in the theoretical simulations; it also offers simple explanations for observed patterns of response to geomagnetic storms. For example, seasonal variations in ionospheric response to storms [Wrenn et al. 1987] are elegantly explained by the dynamics of the composition bulge. A solstice storm simulation, which we performed to verify the seasonal response, has confirmed our conclusions.

Meridional neutral wind surges can explain the shape and size of the equatorial dynamo electric fields following geomagnetic storms. This has aided in the interpretation of data and the construction of an empirical, analytical low-latitude electric field model for storm and recovery conditions [Fejer and Scherliess 1994].

We have developed a new post-run processor capability to analyze the time evolution of energy density at different latitudes. We are studying the propagation of kinetic, internal, and potential energy as a function of time and location. The preliminary results indicate a larger than expected role for the potential energy term in the transfer of energy from high to low latitudes. Joule heating at high latitudes lifts air parcels and thus increases their potential energy. The global wind field then transports the air parcels to lower latitudes, where the energy is dissipated. This effect seems to account for most of the energy transport from high to low latitudes.

X Fejer, B. G. and L. Scherliess, Time Response of Equatorial Ionospheric Electric Fields to Magnetospheric Disturbances, *Submitted to Geophys. Res. Lett.*, 1994.

X Wrenn, G. L., A. S. Rodger, and H. Rishbeth, Geomagnetic Storms in the Antarctic F-region. I Diurnal and Seasonal Patterns for Main Phase Effects, *J. Atmos. Terr. Phys.*, *49*, 901-913, 1987.

(NASA-CR-197550) AN INVESTIGATION OF THE MID-LATITUDE STRUCTURE OF GEOMAGNETIC STORM EFFECTS IN THE THERMOSPHERE-IONOSPHERE Annual Progress Report No. 2 (Colorado Univ.) 1 p

N95-70465

Unclas

Z9/46 0034028